The FLEET OWNER

In This Issue:—

¶ Centralizing Fleet Maintenance

¶ What Work *Should be* Farmed Out?

¶ Designing *a* Bus Garage

¶ Straightening *Bent* Frames

¶ Refacing *the* Valves

¶ Selecting *the* Battery

¶ Why We Buy *Thru* Jobbers

¶ Trouble Shooting Department

— and many other Features

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OPERATES FROM ANY ELECTRIC LIGHT SOCKET

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Tools for #826 Machine
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Price
826 110 volt - 60 cycles $75.00
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A rainy … akdown

… then he "li… hood"

A hurry call for help one rainy day started him thinking. Out on the road was another bus in trouble. Another schedule broken. More disgruntled passengers. Another debit entry on the maintenance cost sheets.

When the bus was finally returned to the service station, he lifted the hood and made an investigation. He soon found out where the trouble was. Water had penetrated into the magneto and put it out of business; yet the magneto had only recently been installed. "Why we used to have the same trouble 20 years ago," he thought to himself, "It's a wonder, in these modern times, that someone hasn't designed a waterproof magneto."

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—it has laminated pole shoes instead of cast iron pole shoes . . . an important factor in the super-energy produced by this magneto.

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The striking differences achieved by the Original-Bosch Super-Energy Magneto in the economical and dependable performance of your fleet, are plainly presented in our new book "Lift the Hood." If you will mail the coupon for a copy we shall also send you a copy of another new booklet, "Ignition Briefly Described," containing an elementary description of various types of ignition equipment.

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"Service Their Own"

Published Monthly by

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HENRY CLAY FISCHER
Editor

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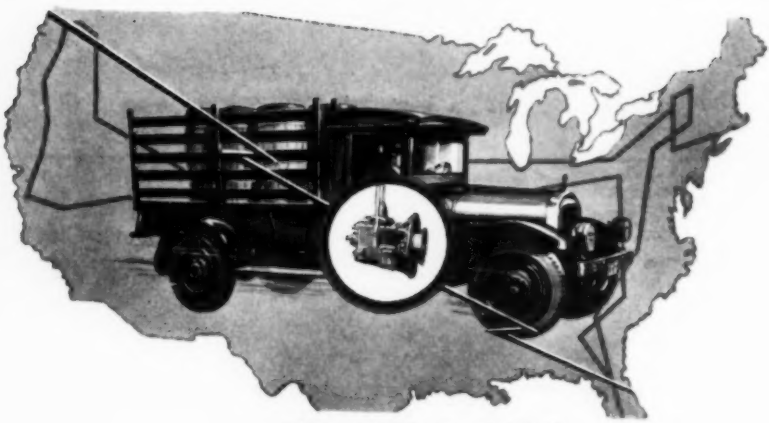

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To Florida—all through the mid-west—on to the west coast—through California, Washington, Oregon—back to New York—down into Pennsylvania—over 50,000 miles—without loss of a moment's time or the expenditure of a cent due to transmission trouble.

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Detroit San Francisco Chicago New York London

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TRANSMISSIONS · CLUTCHES · CONTROLS · POWER TAKE-OFFS

The FLEET OWNER

"For Those Who Service Their Own"

PUBLISHED monthly in the interests of Automotive Fleet Owners who maintain their own Repair and Service Shops, and devoted to the better operation and maintenance of Trucks, Passenger Cars, Busses and Taxis.

HENRY CLAY FISCHER, Editor

Vol. 2 **New York, January, 1929** **No. 1**

The Auto Shows and the Fleet Operator

IN almost every city of any appreciable size there will be held, this month and next, an automobile show. In both New York and Chicago, the shows will be conducted on a *national* basis; in other cities they will be purely local in scope.

Some who read this will ask "What do these shows mean to the fleet operator?" The answer is—*"they mean everything,"* for most of these exhibitions will house many of the latest models of trucks, busses, passenger cars and tractors, and will directly reflect the progress in construction and development that has been made during the past year.

At previous automobile, road, power and equipment shows, those fleet operators who attended, will no doubt recall the wide variety of products exhibited and the manifold advantages they gained by attending. While it is true that many operators were not in a position to immediately avail themselves of this new equipment, yet they went home with new slants on their problems and something to think about.

It behooves every fleet operator, therefore, to attend at least

one show this year and to see that as many of his personnel attend who can; particularly those in the *maintenance* end of the organization. Thus the advances made in production, equipment and operation may be closely studied by all. In short, automobile shows are a good thing.

Centralizing Fleet Maintenance

OUR feature article this month treats with the advantages to be gained by the operation of a *centralized* fleet maintenance shop. It is written by a practical man who has had many years of experience in fleet operation. Incidentally, the Automotive Service Association had the pleasure of hearing this paper read before them, at a recent meeting.

Having been found both practical and economical by one of New York City's largest public utilities, and its affiliated companies, it goes without saying that the servicing of an automotive vehicle fleet, under the one organization and roof, is a good method of procedure for fleet operators to follow.

Those who read this article (and every fleet superintendent should), will no doubt have some comment to make on this subject. The editor will be very glad to get the general reaction that this article brings.

Piston Ring Replacement

THE question, "When to replace piston rings" is one which is receiving considerable thought in these days of high speeds and high compressions.

It has been found consistent and necessary in fleets of light, low-priced vehicles, such as salesmen's coupes, ¾-ton and light delivery trucks, to discard the original piston ring equipment at early mileages of around 5,000 to 7,000 miles, according to the experiences of many fleet operators we have interviewed on this subject.

In an early issue of this publication there will appear an interesting article covering the subject of ring replacement thoroughly. Meanwhile, we shall be interested in learning what the consensus of opinion on this subject really is. Write to the editor, even if only a few lines, telling us your experiences with piston ring replacement—*and watch for the article!*

Dirt, steel chips, grit can ruin the best ball bearing in the world.

New Departures are as strong and as tough as any part of the car.

Certainly they withstand all the shocks and loads that a car encounters. Yet they are the most accurately made and finely finished articles ever used commercially, and, as such, require especially careful handling to give the full long life that is built into them.

"Do and Don't" is a booklet that will not take you five minutes to read . . . but which will add tens of thousands of miles to the cars you sell and service.

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Centralizing Our FLEET Maintenance

By Henry V. Middleworth*

AS far back as 1901 when our Company purchased its first automobile, the problem of maintaining a fleet of automobiles had not been seriously considered. We depended largely upon the garage repairman who in most instances was inexperienced and untrained. Occasionally the chauffeur took a whack at repairs which frequently ended with disastrous results, and the car went out of commission for a day or two.

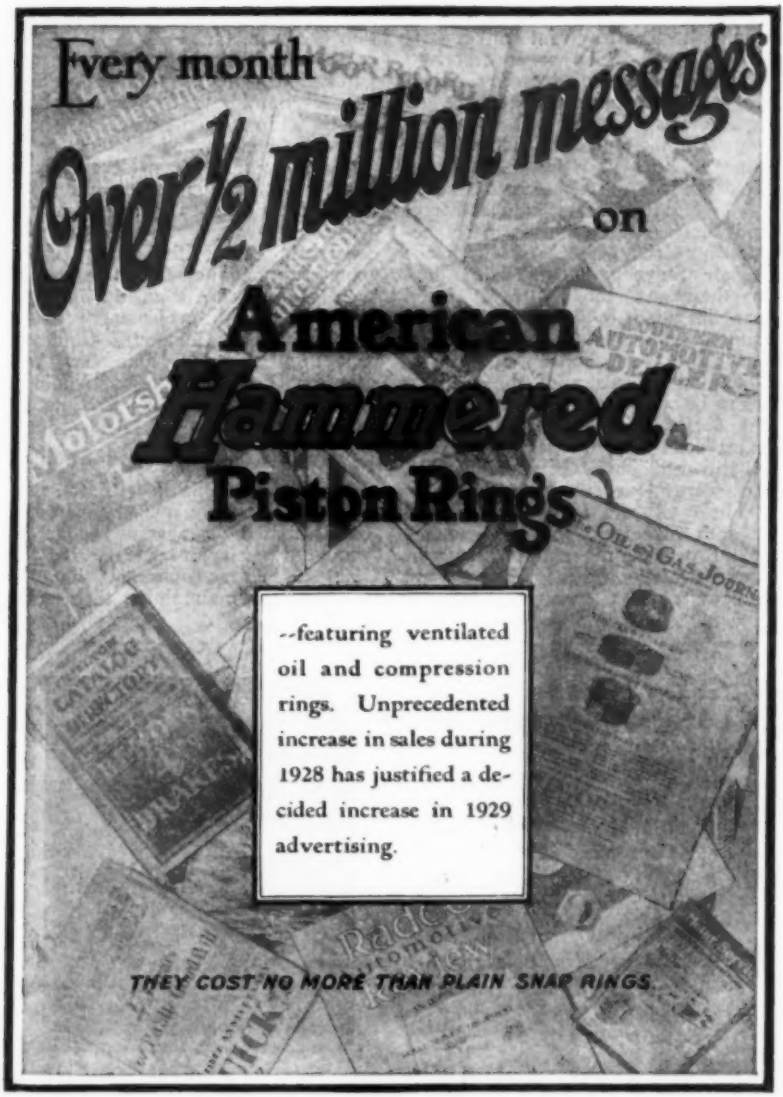
It was not unusual for the chauffeur to call up his boss and say, "I'm sorry boss I can't meet you this morning, the car is broken down". Also occasionally when the chauffeur was late for duty, he would use this excuse for his tardiness and, to use the slang phrase, "Get away with it".

As our automobiles began to increase in number, we began to realize that some provision should be made for repairs and maintenance so we started a repair shop in the lower floor of a brick building located at 439 West 18th Street and formerly used for the storage of wagons used in connection with one of our stables at the same location. We employed a mechanic and managed to keep the cars on the street part of the time at least.

These conditions continued until the later part of 1913 when our fleet had grown to six emergency cars, two gasoline trucks, seventeen electric trucks and eighteen passenger cars, making a total of 43 automobiles.

On December 18, 1913 the organization of a Transportation Department and the establishment of a

* *Superintendent of Operations, Consolidated Gas Company of New York, and its affiliated Gas and Electric Companies.*


Every month
Over ½ million messages
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American
Hammered
Piston Rings
--featuring ventilated oil and compression rings. Unprecedented increase in sales during 1928 has justified a decided increase in 1929 advertising.
THEY COST NO MORE THAN PLAIN SNAP RINGS

Transportation Department pay roll was authorized to go into effect January 1, 1914. The organization to include all the employees engaged in the operation and maintenance of automobiles together with those engaged in the operation and maintenance of horses and horse-drawn vehicles and of the Company's stables.

The building located at 21st Street and First Avenue and formerly occupied by the Meter and Appliance Repair Shops was remodeled during the summer and fall of 1913 and was intended to accommodate the automobile repair shops and to garage eighty automobiles.

The organization of the Department began January 1, 1914 when the former garage located at 439 West 18th Street was vacated and all the automobiles, equipment, tools, etc., were moved to the new garage.

The mechanics formerly employed at 18th Street Station and engaged in the overhauling and repairing of horse wagons, Street Department tool carts and Company automobiles were taken over by the Transportation Department.

The shops connected with the organization were as follows:—Paint shop, trimming and harness shop, woodworking shop, machine shop, blacksmith shop and battery shop. They all required considerable preliminary work in order to place them in shape to accomplish the work required.

In addition to the parent Company's automobiles there were garaged and cared for at this garage, New York Edison Company, New York Mutual Company, Standard Gas Light Company and New Amsterdam Gas Companies automobiles numbering in all approximately sixty at that time.

Need for Centralized Shop

THE automobile fleet of the parent Company and the fleets of the affiliated Companies began to grow to such an extent, that by 1920 it became apparent that the facilities for maintaining their auto-

"IN preparing this article, I have endeavored to outline the conditions existing in the early days of fleet operation and maintenance, and to show that because of the rapid growth of our Companies' fleets, the establishment of a general automobile repair shop became imperative.

"I have also endeavored to describe briefly its organization equipment and operation."—Henry V. Middleworth.

NOTHING IS APT TO COST SO MUCH AS A BEARING THAT COST SO LITTLE

You men who plan, build, use or *pay* for machines of any kind, remember this: It costs more to *replace* a poor bearing than to buy the best one that SKF ever produced. *And SKF Anti-Friction Bearings are the*

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SKF

Ball Bearings **Roller Bearings**

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How the Consolidated Gas Company (and Affiliated Gas & Electric Companies) Keeps Its Fleet of More Than 1400 Vehicles On the Road

(*Continued from page* 12)

mobiles were fast becoming inadequate and a thorough survey was made of the actual conditions existing, not only in the parent Company but in all of the affiliated Companies.

The result of the survey indicated the need for a general repair shop centrally located where the automobiles of the several Companies could be reconditioned, repaired and maintained efficiently and economically.

After several localities had been discussed, the most practical location from a geographical viewpoint seemed to be the Company's property situated along the line of the New York Central railroad tracks at 153rd Street and Cromwell Avenue, and it was finally decided to build the General Repair Shop on this site.

The building began September 4, 1924, was completed early in 1925, and began operating in April 1925. The plant when completed covered an area of approximately 50,000 square feet and became known as the 153rd Street Reconditioning Station.

After a year's operation due to the rapid growth of the Companies' fleets it was found to be inadequate, and an addition covering approximately 32,000 square feet has been erected and recently placed in operation making a total area of approximately 82,000 square feet.

Under this one roof the reconditioning, major repairing and painting of the transportation equipment of the parent Company and its affiliated Gas and Electric Companies is done.

It is not to be understood, however, that all of this work is done by us independently. We have learned that the volume of work in certain specific operations would not justify the installation, maintenance and operation of expensive machinery and equipment necessary to do this work. Consequently, such work as chromium nickel plating, cylinder grinding, overhauling magnetos, generators and starting motors, welding, etc., is sent outside to those who make a specialty of such work.

The combined fleets of our Companies now number over 1400 vehicles comprising over 600 gasoline trucks, 350 electric trucks of various capacities, 15 emergency cars, and about 450 passenger vehicles.

In addition to the automotive equipment mentioned there is also about 3,000 units of miscellaneous equipment such as pole dinkies, compressors, tool carts, derricks, etc., which are kept in repair at this station.

Has Eight Divisions

THE Station is apportioned into divisions each one specializing in the work assigned to it. The Inspection Division, Disassembly and Assembly Division, Motor and Transmission Division, Electric Truck Division, Electric Storage Battery Division, Blacksmith Division, Woodworking Division and Painting and Trimming Division.

(*Please turn to page* 16)

Service to all Branches of the AUTOMOTIVE INDUSTRY

KEEPING well in advance of the requirements of the automotive industry by being ready to serve when fast service is needed, Federal-Mogul is always in a position to meet the most urgent demand for prompt service on standard equipment or replacement bearings, bushings and bearing metals.

Thirty years of efficient service is behind us—each year has seen steady development in product and manufacturing equipment. Today we offer still further increased facilities for complete service to every branch of the industry.

To the distributor, dealer and garage man, Federal-Mogul offers the most complete line of replacement bearings and bushings obtainable. We can furnish bearings and bushings for any make of passenger car, bus, or motor truck no matter how new or how old—and we can furnish them quickly.

The **FEDERAL-MOGUL COMPLETE LINE**

Standard Equipment

Bronze-Back, Babbitt-Lined Bearings
Die-Cast Babbitt Bearings and Bushings
Bronze Bushings
Bronze Washers
Bronze Castings
Babbitt Metals
Bronze Cored and Solid Bars

Replacement

Bronze Back, Babbitt Lined and Die Cast Connecting Rod and Main Bearings (Standard and Undersize)
Piston Pin Bushings
Connecting Rod Bolts and Nuts
Bearing Anchor Screws
Bronze Bars and Babbitt Metals
Shoemaker Rebabbitting and Line Boring Equipment
Licensed under Letters Patent of the United States Nos. 1,455,939 1,302,838 1,302,584 1,340,337

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Detroit, - - Michigan

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Chicago, Ill. Kansas City, Mo.
New York, N. Y. San Francisco, Cal.
Atlanta, Ga. Dallas, Texas
Los Angeles, Cal.

Mogul FEDERAL

A Foreman is directly in charge of each division and the work is laid out, supervised and inspected by a General Foreman in charge of all divisions who co-operates with and is directed by the Assistant Superintendent of Maintenance and the Superintendent of Maintenance.

When a vehicle enters the Reconditioning Station it goes direct to the Inspection Division where it is thoroughly gone over by a competent Diagnostician who indicates upon the inspection sheet the work to be performed.

This inspection sheet then goes to the General Superintendent's office for approval before the work cards are made.

A card system is kept covering the history of each vehicle. Upon this card is recorded the dates it has been in for repairs, the extent and cost of each repair and the mileage the vehicle has covered since the last repair. From this card the General Superintendent determines whether the vehicle should be reconditioned, assigned to other service or retired from service.

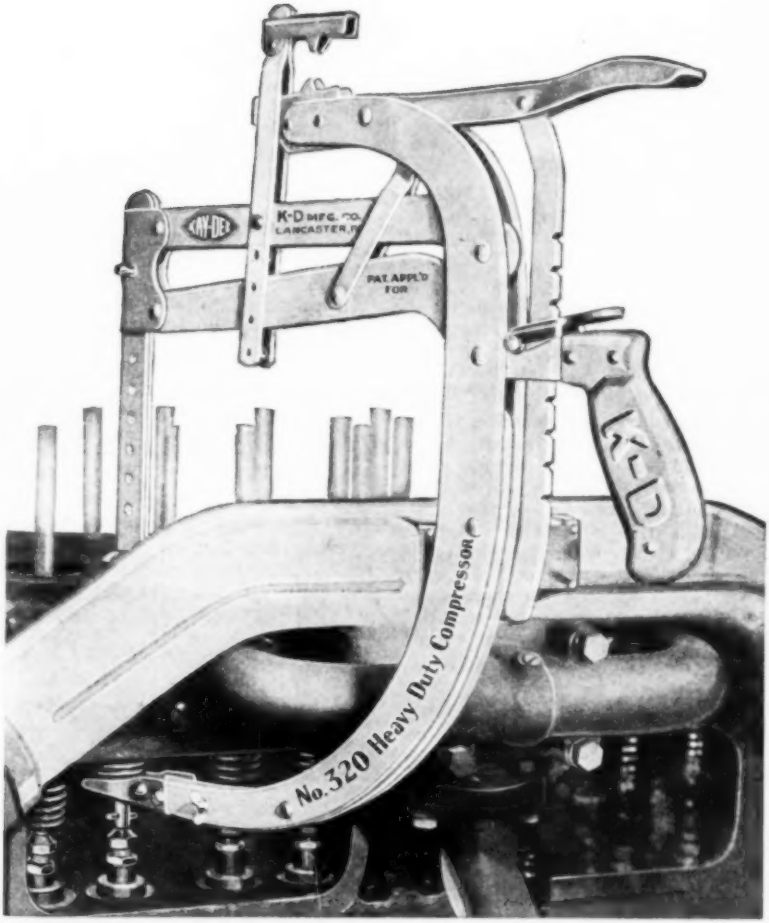
After the Inspection Sheet has been approved, a work card is made for each Division through which the vehicle is to pass, indicating the work to be performed by each Division.

These work cards go with the vehicle and remain with it until all the work indicated on them has been completed. They are then attached to the original Inspection Sheet and forwarded to the office where the labor and material slips are also attached.

The motor and transmission department, where engines and transmissions are overhauled, during spare time, while replacement units are being used in service.

By this method it is possible to ascertain the nature of the work performed, the material used, and the cost of the labor in each Division. In fact the total cost of the job may be computed in a very few minutes after the work has been completed.

Now if we follow one of these reconditioning jobs through the various Divisions, we will get a better



No. 320 Heavy Duty Compressor designed to service large motors without removing manifold. Automatic lock allows operator free use of both hands to remove Valve Keeper. For replacing springs in motor the compressor attachment will take all sizes of springs which are conveniently held in adjustable spring holder, furnished with each tool. An extra set of offset jaws are furnished for motors with low port opening. Made of heavy gauge steel, rigidly reinforced for hard service. Udylite rust proof finish. Price $7.59 net.

No. 325 Special Compresser for Mack "Bull Dog" Motor ONLY where air cleaner is mounted on motor side of dash. Price $7.50 net.

K-D MANUFACTURING CO., Lancaster, Pa.

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idea of the manner in which the work is handled.

The Reconditioning Routine

FIRST the vehicle goes to the washstand where it is thoroughly cleaned. This process not only aids the mechanics in their work, but insures cleanliness throughout the entire operation of reconditioning the vehicle.

The vehicle is then sent to the Disassembly and Assembly Division where it is taken down and the various units forwarded to the Divisions in which the work is to be performed.

It might be well to mention at this time that we have standardized our equipment sufficiently to enable us to carry in stock such spare units as motors, transmissions and rear ends and it is not longer necessary to hold the vehicle out of service while the motor, transmissions, etc., are being overhauled. The spare units are drawn from stock and installed on the vehicle. This process speeds up the work and enables us to get the vehicle back into service in much less time than would be required by the old method.

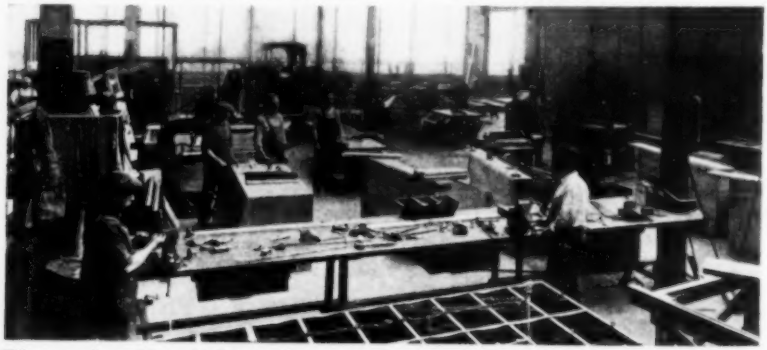
Another method employed in speeding up the work is where body repairs are needed and the other Divisions are not ready to start their part of the work, the vehicle is sent to the Woodworking Division and the body work completed first.

Paint Shop a Feature

ONE of the outstanding features in this plant is the Paint Shop which has been provided with the latest methods known to science for the safe application of pyroxylin enamel (commonly known as "Duco"). It has also been provided with a very unique and efficient ventilating system which supplies pure air from above the vehicle and draws off from below the vehicle any of the active material that might exist as a result of spraying.

There are thirteen open spraying stalls, each equipped with a metal canopy over the vehicle through which the pure air is forced down, and a grating under the vehicle through which the fumes are drawn

(*Please turn to page* 66)



The woodworking division; here every type of body repair work is done which is a rather large order, inasmuch as the fleet is large and varied

Mr. Service Manager

Don't take a chance on **ANY MAKE** of **PISTON PINS.** In that next overhaul job install "Elgin Quality" Piston Pins.

They are made in an exclusive piston pin factory by piston pin specialists, and are guaranteed by the factory not only to replace a defective piston pin, but also to compensate for labor and material caused by any **"ELGIN QUALITY" PISTON PINS** breaking in the motors.

IF YOUR JOBBER CANNOT SUPPLY YOU WRITE TO US DIRECT FOR OUR NEW 36 PAGE CATALOGUE AND PRICE LIST.

THE FACTORY BEHIND THE PRODUCT

ELGIN QUALITY TRADE MARK PISTON PINS

ELGIN MACHINE WORKS

ELGIN, ILLINOIS

NATIONAL STANDARD PARTS ASSOCIATION NSPA

What Jobs *should be* Farmed Out?

By **E. C. Wood***

FOLLOWING are summaries of and quotations from replies received to a questionnaire on this subject. They will give some idea of the trend of maintenance work on the Pacific Coast. I feel that operators are looking forward to some important results from the experiments of two large fleet operators, of whom one has farmed out the work on 400 vehicles and the other has partly farmed out the same number of vehicles.

Fleet No. 1—Vehicle Maker Does Overhauls

THE company operates its own shops primarily for maintenance. Overhaul is cared for largely by a reliable service department of the makers of the vehicles. A very close inspection system, such as servicing and greasing is maintained. One mechanic is employed who merely reports to the superintendent the mechanical condition of the equipment. Contracts are made with outside filing stations for gasoline and oil. A tire foreman takes care of the tires. Upholstery and painting work is contracted for with an outside shop.

Whether it would be cheaper for the company to maintain its own shop on a major-overhaul basis is a question. Getting results is the all-important consideration and is all that is expected.

Fleet No. 2—Follows Stitch-in-Time Method

THIS fleet operator feels that the stitch-in-time method is the one to follow. He employs traveling mechanics who service 95 per cent of the vehicles. These men follow an established itinerary, care for minor repairs, and render reports on the condition of the vehicles and on repairs that have been made. As the drivers are required to be proficient, the traveling mechanics teach them how to drive, driving being incidental to their duties as salesmen.

Major repair work is sent out and is checked over very closely by the traveling mechanics against the specifications in the bids. The work done is then checked against time and material itemized on invoices when re-

(*Please turn to page* 22)

* *Superintendent of Transportation, Pacific Gas and Electric Company, San Francisco, Calif.*

Cutting Costs of Operation

by using WARNER GEARS is a sure step toward **Increased Profits**

The experience of more than a quarter-century of gear making is reflected in the ease and quietness of operation and long-lived rugged dependability in service that is guaranteed in WARNER GEARS.

Always Quiet and Dependable— Let them Prove Their Worth to You

"Ask your Jobber Salesman"

WARNER GEARS

"A Product of Experience"

WARNER GEAR COMPANY *Established 1901 Service Parts Div.* **MUNCIE, IND., U. S. A.**

NEW YORK CITY ATLANTA DALLAS OAKLAND, CAL.

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What Work to Farm Out and What Work to Do in the Fleet Owner's Shop—Read What Seven Superintendents Have to Say on This Subject

(*Continued from page 20*)

ceived. As a result of this system, it is necessary merely to have a garage for storage purposes.

Fleet No. 3—Uses Unit Replacement System; Does Own Work; Farms Out Tire, Electrical and Painting Work

THE unit-replacement system is used exclusively, and the operator finds that better results are secured by this method. He is able to keep the vehicles on the street, and facts at hand prove this to be the most economical system he has yet tried. Greasing, oiling, gassing and similar servicing is done in his own garages.

Throughout the territory are located small shops in which minor repair work is done. No regular overhaul period is set, and when a unit is reported in need of overhauling, it is sent into the shop for repairs. In some cases a replacement unit is sent to the vehicle in the field, where the exchange is made, and the replaced unit is returned for overhaul. The units cared for by the replacement system include engines, transmissions, and differentials

Painting, upholstery work and tire repairing are sent out. The farming out of repairs has been tried, but poor workmanship, inability to get service when wanted, and unnecessary delay in performing the work resulted in a decision a year or so ago to return to old system, under which it is not necessary to carry spare equipment.

Fleet No. 4—Operates Own Shop; Has Efficient Inspection System

IN operating and maintaining the fleet, the sales department's organization is followed both as to personnel and geographical segregation. The company is organized into 16 territorial districts, 12 of which have completely equipped garages capable of caring for general overhaul work. In the four other districts the maintenance and overhaul work is done either by adjoining districts or by outside concerns. Each district is charged with the responsibility of maintaining and operating the vehicles within the district in accordance with standards of maintenance and mechanical practices issued by the office of the automotive department in Los Angeles.

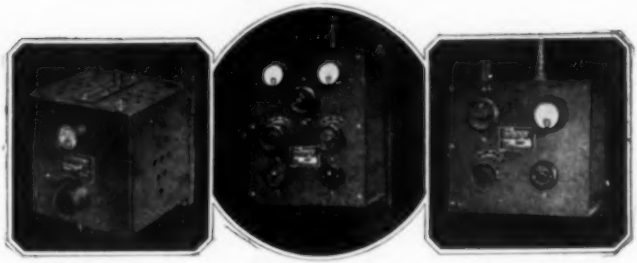
The district automotive personnel consists of the equipment man, who is responsible for the vehicles within the district; a shop foreman; shop mechanics; and traveling mechanics, who report to the equipment man.

Mechanical maintenance of the vehicles is accomplished in the following manner.

"The fundamentals of our system for handling mechanical repair work on our fleet are to clear all trouble as reported by the drivers on the trouble tickets and to defer major

(*Please turn to page 62*)

Let TUNGAR solve your *battery problem*



6 Battery Tungar $45 Net

30 Battery Tungar $135 Net

15 Battery Tungar $75 Net

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GENERAL ELECTRIC

Designing *a* Bus GARAGE

By H. M. Steward *

WHEN the electric railways first began to use buses, car houses or similar buildings were used to house them. In many cases the car houses were built in long, narrow sections, open at each end, and in order to use them for buses, it was necessary to operate in one end and out the other. In the beginning, repairs on buses were light and the quarters afforded in car houses were sufficient. As the buses continued in use, more extensive repairs were required and it was soon found that proper facilities could not be provided for repairing buses in the long, narrow-shaped buildings without interfering seriously with the operation of the buses through the buildings.

In some cases, where local ordinances permitted, an attempt was made to use the car house repair pits for overhauling buses. When only a few buses were handled in this manner, no particular difficulty was experienced with regard to proper ventilation, but as the buses increased in number, means for providing proper ventilation became difficult. On some properties as the number of buses increased, adequate housing requirements were met by making additions to the car houses, where possible, or new buildings were erected to be used solely for garage purposes. In many instances, the shape of the new buildings, however, followed the lines of car house construction, that is, they were long and comparatively narrow.

An inspection trip made a few years ago by the engineers of the Public Service Railway of New Jersey, taking in practically all of the larger properties in the east and the middle west, including not only railway but commercial garages, developed that a garage building

* *Supt of Maintenance, Boston Elevated Railway Co., Boston, Mass.*

More mileage

in these tougher ball bearings of Molybdenum Steel—hardened throughout

STRENGTH and stamina to buck the shocks and heavy loads, to withstand the gruelling high-speed service of modern motor transportation is built into every Fafnir Ball Bearing. Molybdenum Steel, the toughest, most load-proof of all, is used in both races and balls.

Every bearing is hardened throughout—not merely case-hardened. Friction is virtually eliminated from this most wear-resisting of all bearings. The deep raceways and large-diameter balls readily absorb both radial and thrust loads. Complete bearing protection is assured. Records prove it.

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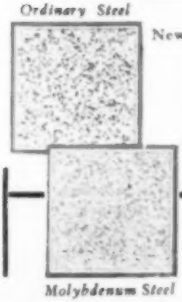

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BALL BEARINGS

The structure of Molybdenum Steel and other steel used for ball bearings can be visualized from the two diagrams. The denser structure of Molybdenum indicates its toughness and wear-resisting qualities. Molybdenum Steel is used in both the rings and balls of Fafnir bearings.

should be as nearly square as possible, to provide for the greatest amount of storage and ease of operation.

Recent Developments

DURING the last five years there has been a rapid development with respect to the proper design for bus garages and a great deal of interest has been shown in this branch of the motor-bus industry. It was realized that the problem with respect to housing buses differs from that with respect to housing trolley cars. A trolley car must necessarily operate along fixed lines on tracks, whereas bus operation is free and flexible.

It is therefore desirable to design buildings to house buses which will allow for the freest movement of the vehicles. Experience has shown that modern garage design should provide for a building as nearly as possible in the shape of a square, with long spanned trussed roofs and with as few columns in the floor space as are necessary. The elimination of columns is of great importance as the length of buses, particularly those used in interurban business, is constantly being increased.

An intelligent study of the requirements for bus garages cannot be made without considering local conditions as follows:

(1)—*The number of buses required in the particular district to be served.*

Outline of proposed Bus Garage of United Railways & Electric Co., Baltimore, Md.

(2)—*The type of buses to be stored.*

(3)—*Available land or site.*

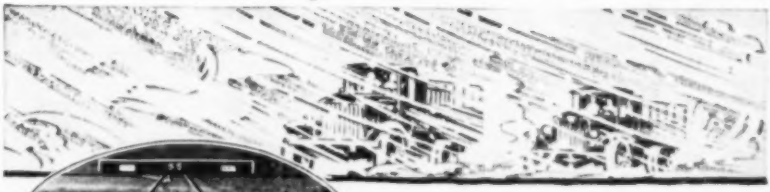
(4)—*Whether repair and overhauling work is to be done at the garage or at a separate shop.*

(5)—*Local ordinance restrictions.*

(6)—*Insurance restrictions.*

In the limited space available, it would not be possible to outline a garage design for any particular local condition, and, therefore, an attempt will be made to cover the subject in a general way, hoping that the information given may be of

The FLEET went out
. . but only two came back!



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—is a heavy duty windshield wiper for trucks and busses.
—insures clearer vision under all weather conditions.
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CINCH VERTICAL SWIPE

No. 624 List price $5.50 each. Squegee 24 inches wide with 12-inch vertical travel. Packed one in a carton. Weight 4¾ lbs.

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A Cinch to *Keep* Windshields *Clear*

some assistance to those contemplating the construction of bus garages.

Number of Buses

IN determining the number of buses to be stored in any one garage, consideration must be given to the number of buses to be kept within any section enclosed by fire walls. This matter has always been considered in connection with car house design in order that the loss in equipment in the event of fire may not be too serious.

At the present time, many of the state and city regulations limit the area of a garage section, if sprinklered, to 20,000 sq. ft. This area will permit storage of about 57 buses which at, say $10,000 per bus, represents an investment of $570,000 in buses alone. It is a question whether larger spaces, even if local regulations permit, ought to be provided and thereby run the risk of destroying a larger number of buses in the event of fire.

It must be borne in mind that a fire in a garage will spread quickly and it is not likely, in the event of fire, that many buses can be removed from the building, even if the garage is located with exits on one or more adjacent streets, and while the loss might be covered by insurance, the loss of the buses would be a serious handicap to operation. A garage section of 20,000 sq. ft. permits an economical design.

A careful study of the probable requirements for bus operation should be made to determine whether a building of this size should be erected even if the immediate requirements do not demand it. If a larger number of buses than can be readily housed in a section 20,000 sq. ft. in area is required, then additional sections can be provided.

Building Site

WHERE possible, it is preferable to construct a building of one story only, in order to provide natural light and to obtain suitable ventilation. Some of the earlier garage designs provided for buildings two and sometimes three stories in height and often with a basement. With such design, considerable difficulty was experienced in providing natural light and proper ventilation.

Buildings of more than one story also require columns which prevent the clear span which is particularly desirable. This is an important factor with respect to choosing the site. It is therefore advisable to select land outside of congested areas in order to have ample room for a one story building and adjacent yard which is desirable for proper operation.

The clear headroom depends on whether single or double-deck buses are to be used. For double-deck buses a clear height of approximately 15 ft. is sufficient and for single-deck buses not less than 12 ft. is desirable.

Bus garages should be constructed throughout, insofar as it is possible, of non-combustible material. In fact, this is a requirement in many sections of the country. When built within the fire limits of cities, the law, in many cases, requires that a garage conform to first-class building construction and in such cases the roof trusses, columns, etc., must be suitably fire-proofed. When fire-proofing is necessary on the roof steel, the length of the clear span may have to be reduced or plate girders used instead of trusses on account of the extra weight of the fire-proofing material.

The writer has found that if fire-

(*Please turn to page* 30)

DEPENDABLE BOSCH MAGNETO EQUIPPED

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Cadillac, Mich.
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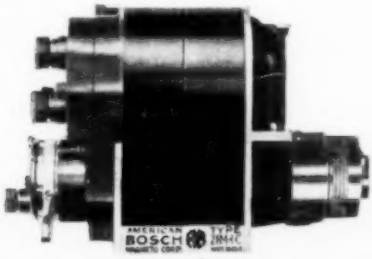
American-LaFrance & Foamite Corp., Elmira, N. Y.
Chrysler Motors Corporation—Graham Bros. Division, Detroit, Mich.
Diamond T Motor Car Company, Chicago, Ill.
Fate-Root-Heath Company, Plymouth, Ohio
Four Wheel Drive Auto Co., Clintonville, Wis.
Larrabee Deye Motor Truck Co.
Binghamton, N. Y.
LeBlond-Schacht Co., Cincinnati, Ohio
Nelson Le-Moon Company, Chicago, Ill.
Reo Motor Car Company, Lansing, Mich.
Republic Motor Truck Co., Alma, Mich.
Stewart Motor Corp., Buffalo, N. Y.
The Autocar Company, Ardmore, Pa.
White Motor Company, Cleveland, Ohio

American Bosch Magneto Corp.
Springfield Mass.



Branches:
New York Chicago San Francisco

Bus Garage of Illinois Power & Light Corp., Decatur, Ill. Note the concrete drive used for testing busses.

proofing is actually required, roof construction with a clear span of over 80 ft. is not practicable. If longer spans are actually required, then it will be necessary to construct the garage with some columns or to locate it in that part of the city where first-class construction is not required.

In certain sections of the country the local regulations allow the use of wooden roof trusses and plank roof and the insurance rates for such construction are satisfactory. While it is possible to construct wooden trusses made up of members having heavy fire-resisting cross section, with tension members of wood instead of wrought iron or steel rods, and also with a reasonably high roof with sprinklers, it is possible to use a plank roof without serious results from fire. It is doubtful, however, whether such construction results in a material saving over the use of steel.

The writer's experience with the use of wooden trusses and planked roof on other types of buildings leads him to believe that more lasting and satisfactory results can be obtained by using steel trusses and some form of light cast concrete or gypsum, or precast concrete slabs for the roof construction.

Light and Air

THE design of the building should be such that the maximum amount of light and air can be provided through the outside walls and by means of large skylight areas with proper ventilators in the roof.

The floors should be of concrete finished with a hard wearing surface in order to resist wear when chains are used during the winter

(*Please turn to page 32*)

Electrical Trouble - Shooting

By D. P. Cartwright

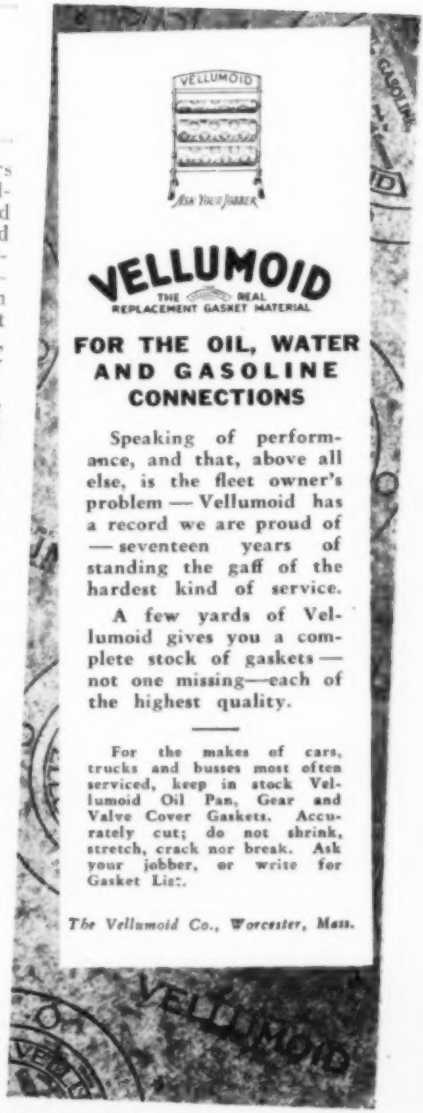
ELECTRICAL equipment wears both mechanically and electrically. Mechanical wear is limited mostly to bearings, brushes and timer-distributors, and can be determined by ordinary mechanical methods. Electrical wear, however, can be detected only by the series test lamp, the voltmeter, the ammeter, the Wheatstone bridge, the growler and the heavy-discharge test set.

Fewer failures would occur if the electrical apparatus were inspected by the skilled electricians and tested with the accurate instruments that constitute the personnel and equipment of the fleet service station which gives sufficient thought to electrical maintenance.

Insufficient lubrication usually develops generator or ignition-unit bearing trouble on the road. The battery is, however, the unit that requires most attention yet is frequently neglected. When water is not added, the plates sulphate and then there are no lights for the drive back to the garage. Corrosion is permitted to form an insulating film on the battery posts and the engine will not start because the current cannot penetrate this film to reach the starting motor and the ignition coil.

The charging rate is not increased in the winter to compensate for the longer hours the lights are used and the heavier duty the starting motor is called upon to perform, and the result is a call for a rental or substitute battery. Another reason for battery calls is the discharge of the

(*Continued on page* 33)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REPLACEMENT GASKET MATERIAL
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The Vellumoid Co., Worcester, Mass.
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months and also to prevent dust. Garage floors present a serious problem with respect to providing a surface which will not absorb oil. Experiments should be made and information sought with respect to securing a material which will not only provide a hard wearing surface but will repel oil and grease.

Unless a very large number of buses are used in any one locality sufficient to warrant special machines or apparatus for washing purposes, the buses are usually washed on the garage floor; in which case the floor should be laid out in blocks of from 30 ft. to 40 ft. square, or similar dimensions, suitably sloped so that the water will be taken care of by means of standard floor drains having 4-in. outlets and provided with a large sand container.

The covers or gratings on these drains and the top castings holding the grating should be of heavy construction. The floor drainage system should be connected with some form of gasoline trap which is required in most cities to prevent the gas entering the sewerage system.

Entrance and Exit

CAREFUL consideration should be given to the number and location of the entrance and exit doors to be provided. These factors will depend upon the size of the garage and its location with respect to adjacent street or streets. In addition to the doors used regularly for operation, consideration should be given with respect to emergency exits which would come into use in the event of fire.

The doorways used for regular operation should be from 14 ft. to 18 ft. in width and at least 1 ft. higher than the highest bus to be operated. Doors of ample size will provide for quick entrance and exit and

(*Please turn to page* 64)

Note the great number of doors. This is another view of the Decatur, Ill., Bus Garage of the Illinois Power & Light Co.

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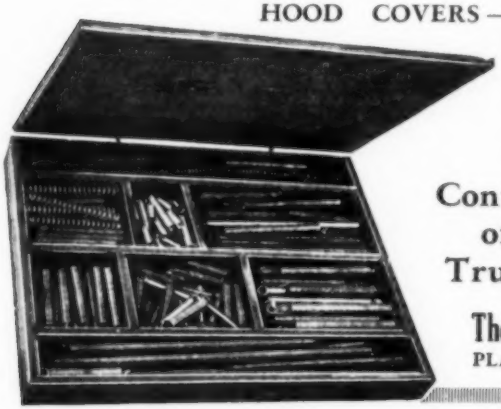

Contains every type of Spring your Trucks might need

The PECK SPRING CO.
PLAINVILLE CONN.

Electrical Trouble Shooting

(*Continued from page* 31)

battery through the ignition coil when the switch is not turned off.

Climatic Conditions

CLIMATIC conditions cause more trouble with batteries than failures in other electrical units. An electrolyte with a specific gravity of 1.300 is very satisfactory for a temperate climate but would shorten the life of the battery in tropical countries.

An interesting fact is that the starting motor is operated an average of about once for each mile of car operation by many drivers in the cities. The summer average is often lower because of the longer trips, and the winter average is higher because the mileage after starting is less than in summer and also because the engine frequently fails to run until the starting motor has been operated two or three times.

Damage to all types of starting mechanisms is frequently the driver's fault. An advanced spark at starting usually results in damage, as the starting motor is suddenly reversed by reverse rotation of the engine crankshaft. Re-engaging the starting motor when the engine is rocking back is another cause of emergency calls.

Most drivers make the mistake of operating the starting motor instead of using the crank or being towed when the battery is nearly discharged. The large withdrawal of current by the starting motor reduces the battery voltage to such an extent that the voltage at the ignition coil is insufficient to create a firing spark. The lower the efficiency of the starting motor the more numerous will be the emergency calls.

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CONSIDER what it means! Half of what you now spend for lining and labor in servicing brakes—half of the loss of use caused by brake repairs.

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DATE	MILEAGE READING	DESCRIPTION OF WORK DONE	COST OF MATERIAL	LABOR CHARGE	TOTAL COST	TIME LOST
		LINED WITH				
		ADJUSTMENTS AND REPAIRS				
		TOTAL				

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MANUFACTURERS OF RUSCO ACE-RUSCO BRAKE LINING AND DURAK BRAKESHOE LINERS

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Frame Straightening

Here Is a New Method That Does Not Require Heat or Elaborate Equipment

By **Henry Clay Fischer**

WE have often visited fleet shops that do their own repairing on vehicles which have been wrecked or severely damaged in accidents and have noticed that the usual procedure in straightening chassis is to lift off the body, sometimes the motor and quite often the gasoline tank, radiator and other units. Then the actual straightening is done by heating, and hammering. The acetylene blow pipe, sledge and a few crowbars are the tools usually employed.

A new method which is said to have revolutionized the practice of servicing wrecked cars, has recently been brought to our attention. But one piece of equipment is required (of which there are several similar devices of various makes on the market) which may be purchased at a nominal cost. With this piece of equipment, commonly known as a "frame-straightener," practically any twisted or bent frame can be brought to its proper contour without the use of heat and in many cases without removing the body—and the straightening may be done entirely in your own shop by any mechanic, as no special skill is required. In fact it is said that perhaps 85 per cent of the straightening jobs, which the fleet shop might encounter, can be performed.

Tough jobs which in the past took hours of hard work and often required the services of a blacksmith or welder, are now a matter of minutes. Frame straightening, once a bane and bug-bear, has seemingly been made simple and easy, and it is said that jobs of this kind, performed with the proper equipment,

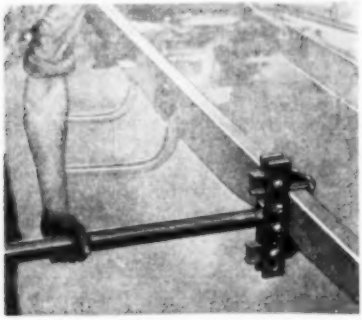


Figure 1—Taking a kink out of the bottom edge.

cannot be detected after the work is completed. The photographs in this article will serve to illustrate the various applications to which a frame straightener can be put.

The heading of this article includes a photo taken of a car that was pretty badly demolished. In this case it was necessary to remove the body, as repairs to the wooden frame of the body had to be made, otherwise the bend in the frame shown, could have been straightened with the body on.

The bend was straightened by applying the tool to a small section at a time. This particular bend, which extended the entire length of the frame was removed in about 15 minutes, without the use of heat. Because the heat ordinarily applied sometimes leaves the metal in an unsafe condition, it is generally conceded that a better job is done without heat. After the operation was finished a test for levelness and straightness was made.

Figure 1 illustrates the removal of a kink in the same frame where the bottom edge was bent in. Only a part of the tool (one of the adjustable clamps) was used. The only other requisites were a four foot length of pipe and a good stiff pull by one or two men.

This procedure might also be applied to a twisted front axle with good results, as well as many other useful and similar operations.

Another typical case is pictured in figure 2. The frame of this Buick was bent right alongside the engine where the car had been side-swiped by another. In this instance the mechanic found it necessary to remove the hood, fenders, running boards, front wheels, springs and axle, (most of these had to be replaced with new, anyway) and then got down to business. He then found that the frame was four inches out of line and in less than ten minutes he straightened it. Here is the actual time as revealed by the ticket.

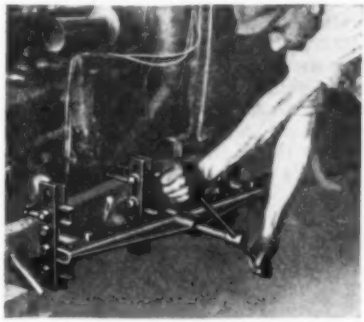


Figure 2—Straightening the frame without removing the body.

	Hr.	Min.
Removing front wheels, fenders, etc., and applying straightener ...	1	15
Actual straightening time		6
Replacing parts		55
Total time	2	16

(*Please turn to page* 38)

Frame Straightening

(Continued from page preceding)

This is an actual case which vividly portrays the value of proper equipment in the shop. No one will doubt that older methods would unquestionably have taken more time, and entail much harder work.

Figure 3 shows the same job and it will be seen that the body was *not* removed from the chassis but was raised about two inches in the front in order to clamp on the straightener. The bolts of course were loosened and the body pried up with wedges. If the bend had occurred in the back of the frame the operation would of course be practically the same.

Should the frame be buckled downward at the front cross member, the straightener may be attached without the end clamps but with short chain-slings in their stead. Plenty of pressure may be obtained to straighten a badly buckled frame and as the clamps are easily detachable this job is also a simple one.

While this article might seem to refer to one particular tool we beg to point out that specifically this is *not* so. The writer has seen two or three different makes of "frame-straighteners" each of which appears to be essentially the same but different in design.

Figure 3—Another view of the job shown in Figure 2.

From the one used in our illustration the reader will perceive that this piece of equipment is composed of several units, the principal one being a heavy, forged, channel-like steel bar with a levered screw passing vertically through its center. At both ends of the bar are claw-like clamps, adjustable in their range, which may be set at various positions along the bar. These positions are determined by the drilled holes in the bar. Another clamp of similar design is attached to the inner end of the screw but it is easily removed.

It is quite obvious that a tremendous amount of force can be applied in many directions by the various applications which can be made. In fact the adjustability of the straightener permits it to be applied in practically any position.

Where necessary, the use of wooden blocks, additional pipe levers and other appurtenances is a great help in bringing frames back to their normal contours.

While in many cases it will be found necessary to use the heat of a welding blow-pipe or torch in straightening frames, it is the opinion of many metallurgical men that it is far more desirable to straighten frames "cold." Most of the metal used in axles and frames is heat treated either before or after forming and the application of additional heat removes some of the temper and results in a breaking up of the molecular structure of the metal. Hence our advice "If possible, straighten it cold."

How the JOBBER *Serves*

Here Are a Few More Reasons Set Forth by Fleet Operators, As to Why They Buy Thru Jobbers

IN previous issues of this publication, we pointed out the fact that an extensive survey made among the readers of THE FLEET OWNER revealed that these fleet operators, for the most part, found it convenient, practical and economical to turn to the automotive jobber, when purchasing material, supplies, equipment and parts.

The reasons set forth by these operators, in the aggregate, hinged upon the questions of service, quality and delivery. Our survey is being continued and a few new thoughts have been presented, which are worthy of mention here.

It will be remembered that in previous issues we pointed out the advantages offered by the automotive jobber, from a standpoint of "having what is wanted, *when* it is wanted." The survey also revealed that the quality of the parts and equipment carried by the jobber can be depended upon.

Taking the matters of quality, service and delivery for granted, therefore, we are next confronted with the questions of trade-mark, brand and price.

From the questionnaires which are daily coming back to us during this survey, it is constantly being brought home to us that the fleet operator, as a general rule, knows beforehand, when purchasing supplies, equipment and replacement parts, just what brand he wants. When he demands this particular brand, he can usually obtain it from his regular jobber—or from one of the automotive jobbers in his vicinity.

The fleet operator is fast learning to "know what he wants." He usually knows replacement parts and equipment by their "first names" and it is not uncommon for him to ask for "a set of Elgin pins; a set of Brown-Lipe or Warner gears; a roll of Rusco or Grafild brake lining; a K-D valve lifter; a Manley brake relining machine; a New Departure, Fafnir or S.K.F. bearing," and so on down the line.

These and other popular, reliable, quality lines, the automotive jobbers are carrying and *selling*. Where the question of a particular brand comes up, the jobber's word is usually taken or it is backed up by a guarantee—the jobber cannot afford to handle any but quality merchandise and in nine cases out of ten he can fill the order to the entire satisfaction of the purchaser.

We will not attempt to stress too heavily the price or discount question. This is a matter for each individual fleet operator and jobber to settle between themselves. It might be said, however, that thousands and thousands of fleet operators have, in the past and present, made entirely satisfactory negotiations with automotive jobbers in their localities, and are purchasing from them continuously, if not exclusively.

It is axiomatic, therefore, that the question of price or discount does not constitute a barrier between the fleet operator and the jobber. On the other hand, granting that a few cents might be saved in some cases, when the fleet operator purchases

(*Please turn to page* 65)

Refacing *the* VALVES

An Outline of the Many Things You Can Do with a Good Valve Refacing Machine

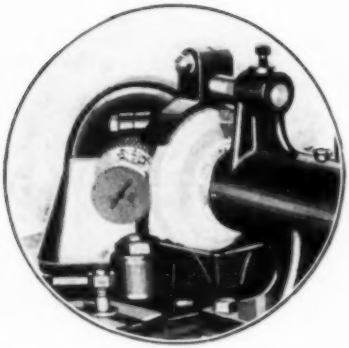
By Henry Clay Fischer

WITHOUT a doubt, the most called-for motor operation that the fleet shop operator is called upon to perform, is "Grind Valves and Clean Carbon." While this is a subject with which every fleet service man is thoroughly familiar and every mechanic has his own set ideas about how this job should best be done, a few thoughts on the subject of valve refacing machines, in conjunction with this most important motor operation, will not be amiss here.

Two of the most common of valve troubles are caused by warped, out-of-true faces and seats and carbonized, worn valve stems. If the valve seat or face is pitted, burned, grooved or worn out-of-true, leakage will occur between the valve and its seat which will not only result in loss of compression, but will ruin both the valve and the seat themselves.

For valves that are badly worn, grooved, pitted and warped, the best and most effective treatment (outside of a set of new valves) is refacing on a machine especially made for the purpose. Many fleet mechanics, of course, prefer to stick to the old, time-honored grinding or lapping method for even the worst cases of worn and damaged valves, but where the amount of wear is great, and the valves are in bad condition, refacing on a machine is the easiest and cheapest way out of the situation.

We will not attempt to outline any set procedure here for grinding valves in the customary manner, as all of our readers know, perhaps to



Truing up a 45-degree angle seat with the refacer.

better advantage than the writer, just how this should be done. However, where the valves are badly worn, and hand grinding or lapping would take too long a time and not accomplish the desired result, the valve refacing machine plays an important part. A quick, accurate job may be produced, and the results will no doubt be gratifyingly satisfactory, if a little care is used in the operation of the refacer.

A valve refacing machine, for the most part, consists of a revolving grinding wheel and a revolving chuck, driven by either one or two electric motors, through belting, gearing or other means of drive. The chuck is adjustable to take the various sizes of valve stems and is sometimes adjustable in position, to take valves with any angle of seat. On the other hand, many models of refacing machines will only accommodate valves with 45-degree angles. The latter class is lower in price, of course, while the universal model is more expensive.

The stem of the valve is first properly centered in the revolving chuck and by means of a sensitive screw mechanism, the face of the valve is brought to bear against the revolving grinding wheel, until the face of the valve has been trued up. It is quite important to guard against removing too much metal or burning the valves. In a few words, this is the story of the valve refacing machine and with a little practice and a good machine, any fleet mechanic can become an "expert" in this line in a short time.

As this is not a "how-to-do-it" article, we will say nothing further about using the valve refacer. When to use it and when to grind the valves without it, may readily be determined by the condition of the valves and their seats. Detailed operating instructions and valuable service information, in most cases, are published by the manufacturers of these machines, and accompany each machine that is sold. Your

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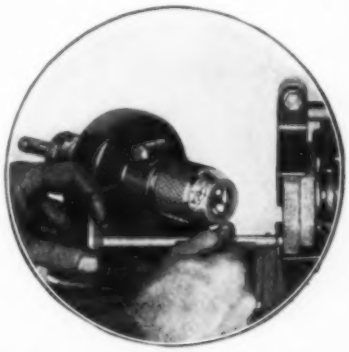


Truing up the valve stem end, another popular use.

Valve Refacing

(*Continued from page* 41)

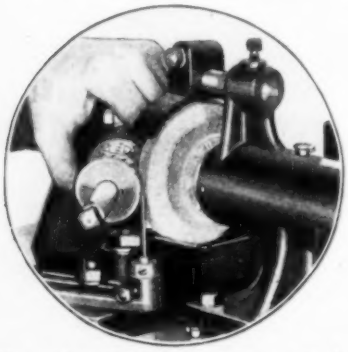
jobber, too, no doubt has one or two of these machines set up for demonstration and from a visit to his establishment you will learn more in five minutes of practical demonstration than might be given here in two or three pages.

Machine Has Many Uses

BESIDES providing a new face on the valve, the user of a valve refacing machine will find that it has many other uses in the fleet repair shop. Perhaps it might be well to outline a few of them here:

First, refacing of valves: By using the valve refacing machine on as many valve jobs as you can, you will find that the work can be done much easier and quicker, thereby helping to cut maintenance costs due to the efficiency of the valve refacing machine.

Second, truing valve stem ends: Ends of the valve stems are in most cases worn out of true. The hardened set-screws constantly tapping at the stem ends play real havoc with them, and it will almost always be found necessary to true-up the stem ends, particularly where excessive clearance has prevailed, making each tap a "hammer-blow." For this purpose, the side face of the grinding wheel on the valve refacer is used—it takes the place of the emery wheel for this particular purpose and saves many steps, perhaps to the other end of the shop.



The valve reseating reamer may be sharpened on the valve refacer.

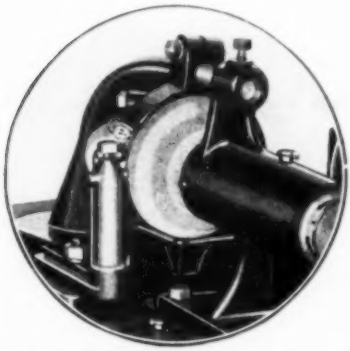
Cleaning carbon from valve with wire-brush attachment.

Third, sharpening valve seat reamers: You will find that where the valve is excessively worn, the seat in the block is likewise badly worn and it becomes necessary to ream out the seat or otherwise recondition it. For this purpose, a reamer is usually used, having, of course, the same angle as the valve head. When these reamers get dull and do not cut properly, they may be sharpened in the valve refacing machine, just as the valve is refaced. This is indeed a decided advantage.

Fourth, cleaning the valves: Cleaning carbon from valves is a tedious job, unless you have the proper equipment. A wire brush in an electric drill, a revolving motor-brush and other methods are used. Another good way is to insert a wire rotary brush in the valve chuck—another good use of the valve refacer.

Fifth, dressing the emery wheel: Many shops use their valve refacers for many grinding purposes; in fact some dispense entirely with a grinder, claiming that the refacer is many tools in one. This of course, is not especially recommended, as it places a rather heavy burden on the grinding wheel and it becomes necessary to dress the grinding wheel more than occasionally. In order that the angle of the valve face that is ground with the wheel may be identical with the original angle of the valve, the edge of the wheel should be used for nothing but valves and valve seat reamers.

Makers of valve refacing machines provide a diamond dressing attachment, which will serve to keep the grinding wheel edge in proper condition and give new life to the crystals, and new cutting ability. When a new wheel is installed, it too must be dressed or trued, as well as an old one which has been used on two or three jobs. In dressing with the diamond attachment, it is important to take *light cuts,* repeating if necessary, rather than heavy ones.



Truing the face of the grinding wheel with the diamond dressing attachment.

So much for the uses of a valve refacing machine. This valuable piece of shop equipment will find its place in any fleet shop, no matter how large or small.

Federal-Mogul Expands Further

GROUND has been broken for another large addition to Plant No. 1 of the Federal-Mogul Corporation, Detroit, Michigan. The new building with more than 22,000 square feet of floor space is the second recent expansion of importance made by this company, as little more than a year ago it was found necessary to increase floor space at both Plant No. 1 and Plant No. 2.

Production plans called for occupancy of the new building about December 15th with increased facilities for the manufacture of Federal-Mogul products which include bronze-back, babbitt-lined and die-cast bearings, bronze bushings, washers, castings, babbitt metals, bronze cored and solid bars, etc.

This company reports the fact that 1928 was the best year in their history. Present indications are that 1929 production will be ever greater than 1928.

Selecting *the* BATTERY

The First of a Series of Articles on the Selection, Installation and Care of Bus Storage Batteries.

By Chester M. Angell*

THE bus and truck battery offers a different problem than the passenger car installation and the bus owner or operating company, when selecting a storage battery, should have two things in mind:

First: A battery to perform the work required of it in a satisfactory manner under all service conditions.

Second: A battery to do this work at the least cost per bus mile.

Of course, in order to make an intelligent selection, it is essential to know the kind of service as well as the operating conditions. If the batteries are for lighting service only, they should be of a different type than batteries that are to be used for lighting and starting service; furthermore, if the batteries are operated on a 24-hour schedule, they might be quite different than those that only operate for lesser periods. The lighting rate and the maximum generator charging rate also should be considered before the size of the battery is finally determined.

There is, however, one principle that should guide the bus operator in his selection of storage batteries. This principle is to always use as thick plates as the type of service and operating conditions will allow, for the thicker the plates in the battery the longer will be the life of these plates and the less buckling, other things being equal.

For lighting service only, there is no reason why thick plates should not be used, but in starting service it is not always possible to use thick plates unless the battery is unusually large. This is due to the fact that heavy thick plates mean a slow give up of current at high rates of discharge and a battery with a few thick plates will not be as satisfactory a starter battery as another battery with twice that number of plates but of only one-half the thickness.

A thick plate battery would have the longer life and, in lighting service, would be most satisfactory but in starting service, this thick plate

* *Engineer, Vesta Battery Corporation.*

battery will most likely not turn the engine over in cold weather and, therefore, would be a failure. A compromise can often be made by installing a larger battery with thick plates, which will give the longer life desired and yet not increase the cost greatly.

Size Is Important

IT always pays to put in an oversize battery in bus service, that is, oversize as viewed from the standpoint of the usual passenger car battery. This is because the service is so much more important and severe; it also insures a slower draw of current per plate on discharge, higher efficiency on charge, less gassing per plate and longer life.

Design of Groups Important

AS the groups of plates are the heart of the battery, their design and manufacture should be very carefully done. Each group consists of a set of negative and positive plates. These plates can be held apart either by some hard rubber isolating device or by the separators themselves, or both.

A badly buckled group.

How one battery manufacturer endeavors to overcome plate buckling by means of locking isolators.

The life of a given group of plates should be the life of the plates themselves and this life should not be terminated prematurely by the failure of the separators, or the filling up of the mud space by the shedding active material. This means that the insulation between plates should be the best possible. This can be achieved with both wood and perforated rubber separators.

The jar ribs on which the groups rest should be high enough to more than take care of all the active material thrown down, during the life of the group.

(*Continued on page* 65)

Selecting and Training Fleet Mechanics

By F. L. Jacobus *

THERE are in the United States today more than 300,000 automobile mechanics, many of whom have learned their trade by the trial-and-error method. They have started as helpers and have picked up sufficient knowledge of the mechanism of an automobile to be able to make adjustments and repairs.

Lack of enough competent mechanics has handicapped the automobile-repair business from the beginning. The situation has grown steadily worse, as the number of cars in use has increased faster than men have been trained for the work. Of those who take up this vocation, 78 per cent have had no special previous training.

At least 100,000 new repair men are needed a year to replace the losses in the ranks and to care for the increased work. Incompetent labor is expensive, and it is impossible to estimate the amount of money that has been spent tearing down and putting together parts that were in perfect condition. If a large truck or bus is taken off its run for repairs and is held in the shop one day longer than is absolutely necessary, the loss in revenue will often exceed the total repair bill.

Repairs and overhaul account for about 25 per cent of the costs of operation. Most service executives

* *Brooklyn Edison Company.*

This Report on the Selection and Training of Automotive Mechanics for Fleet Operation Was Prepared in Collaboration with the S.A.E. Operation and Maintenance Committee

(*Continued from page preceding*)

will agree that it is almost impossible to get an adequate number of good, reliable mechanics. No doubt one reason has been that wages for this class of work have not been high enough to attract men who are mentally alert, but such conditions do not exist today in the larger organizations because they are willing to pay very good wages for the right kind of men.

Automotive design has become somewhat standardized, production and sales are highly developed, but service is just now experiencing its greatest growth and offers its greatest opportunity.

Transportation is one of the essentials of human existence, and the automobile has in increasing volume supplied the need until it is no longer a luxury but a necessity. Without proper methods of servicing and a sufficient supply of trained personnel, the automobile loses its efficiency.

Selection of Mechanics

THE selection of men for training has not had the proper attention and some service managers will not bother with graduates because their experience has been that only about one out of five is adapted to the work. There is a tendency to commercialize the automobile school and to operate on a financial basis rather than on service to the student in the shop, and the graduates of such schools tend to lower the reputation of all other training schools.

Without an inborn love of tools and machinery, the prospective mechanic can never hope to get very far. If he likes machinery, he has probably worked in a factory or machine shop or has tried to get some kind of a mechanical job.

Some men graduate and apparently are well fitted for their jobs, but they have no urge to produce. The best type of man is one who has a widowed mother or brothers and sisters to support and realizes that he must work.

If the man has already had some automobile experience and wants more, he should be given the opportunity to acquire it. The best prerequisite training, aside from that in a service station, is given in a good machine shop where the man learns what a thousandth of an inch means and what its effect may be on the fit of a bearing.

The prospect's references should be thoroughly investigated and all of his previous employers heard from before he is accepted.

Every man accepted for training should possess the inherent qualifications of an inspector or service salesman. If he continues his course, he will want to work into one of these positions, in which he can deal directly with the customers.

The prospect's desire to improve himself by training is highly commendable and should not be discour-

(*Continued on page* 48)

aged whether he is accepted or not.

The more education the prospective mechanic has, the better it is, so long as he does not object to wearing overalls and getting his hands dirty.

Without previous automotive experience the best age is from 18 to 22, but a man's practical experience should be given due consideration.

Recommends Standard Course

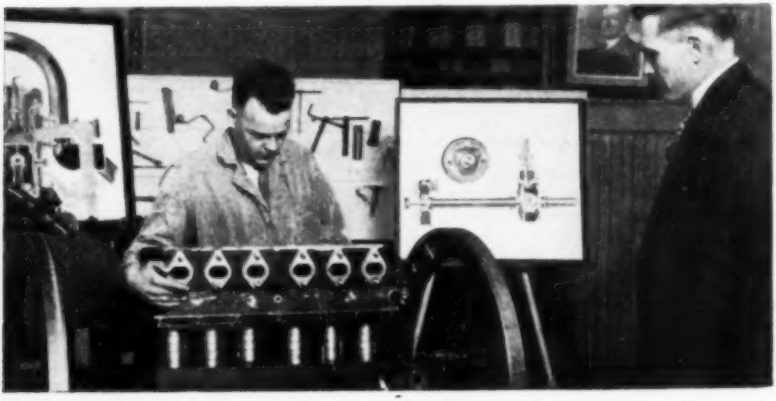
THE Operation and Maintenance Committee of the S. A. E. recommends serious consideration of the project of developing a standard course of training for mechanics. The objective of such standardization of courses is to secure greater uniformity in the output of men, so that those who hire graduates may know more certainly what to expect of them and what further training they need to be useful to their employers.

The service division of the National Automobile Chamber of Commerce in 1924 appointed a special committee to study the situation regarding the training of mechanics. The conclusion reached was that a standard course is desirable.

Such a plan would be of no value unless some means were provided for checking either the school or the graduate. All institutions would see the advantage of advertising the course and, unless a careful check was made, the result would be a worse situation than we have at present. We would be as uncertain, or more uncertain, than we are now as to what to expect from training school graduates.

This is not to be confused with licensing of mechanics such as might be brought about by State laws, which, experience in other lines indicates, is dangerous, and leads almost inevitably to unionizing of shops. The automobile industry so far has been almost exclusively open-shop to the great advantage of employers, employees and the public.

There are five types of schools to



Learning how to service a sleeve-valve engine in a company-owned school. This type of school is perhaps the most thorough in its methods.

be considered:

1—*Commercial.*
2—*Semi-Endowed.*
3—*Public Schools.*
4—*Endowed.*
5—*Company Owned.*

Commercial schools are those which will give what the student will buy. Endowed, semi-endowed, public and company-owned schools give what the student should have. We should try to devise a training course which will be acceptable for all five classifications.

Recommendations

IT is recommended that the shop work of the course be handled on a cooperative basis with the service stations. An arrangement could be worked out whereby a student would work alternately in the service station and in the school shop. This would give the student an opportunity to get specialized training on the car he intended to work on after graduation, and would allow the service station to see whether he was worth hiring.

The school would not graduate the man unless, in his shop work, he showed that he would make a good mechanic.

A questionnaire sent to fleet operators and service stations indicated that courses could be improved by giving the men more practical knowledge, and more training in the use and application of tools.

It is earnestly recommended that the possibilities of all of the above suggestions be thoroughly investigated by a committee appointed by the Society of Automotive Engineers to determine the advisability of the Society's engaging in some concrete effort to increase the available supply of competent help in automotive fleet repair-shops.

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THE FLEET OWNER

"for those who service their own"

90 West St.
New York City

Here is the author's idea of what a good headlight should do without causing undue glare.

What's Wrong with our HEADLIGHTS?

By W. D'Arcy Ryan*

DESIGNERS of the early electric automobile-headlights had the one thought in mind of producing the maximum amount of light ahead to satisfy the man behind the steering-wheel; they had no thought of the effect of such headlights on the approaching driver, a feature apparently considered only recently. Their effort to outshine everything on the road resulted in an intolerable and dangerous situation which increased with the automobile traffic until, with millions of automobiles on the roads, it has become necessary to enact laws to protect the automobile drivers from each other.

Exhaustive tests, which resulted in the so-called "I. E. S. Specifications" that many States have adopted, were made by the Illuminating Engineering Society. They were not advocated as being ideal specifications but were formulated on the basis of a compromise between glare and range of sufficient light on the roadway for safe driving, based on the best available units in existence at the time of the tests in question and also based on the automobile-traffic situation then existing.

Accident statistics were studied and conclusions were drawn to the effect that although glare is disagreeable and dangerous it is not the primary cause of night accidents, a greater number being attributed to insufficient light on the roadway.

* *Director of General Electric Company's Electric Illuminating Engineering Laboratory.*

An Authority Points Out Some of the Faults of Present-Day Vehicle Headlamps

(*Continued from page preceding*)

Further analysis probably would have shown that improper distribution of light on the roadway, irrespective of the number of lumens delivered, was responsible for a large percentage of the accidents.

Glare is the only thing that ever put me in a ditch or caused me to turn a car over by side-swiping it on account of misjudging the passing space available. I believe that the public feels glare to be a greater menace than anything else we have to contend with at night. As a result, the automobile adjusters, irrespective of any specifications issued, are depressing the headlights to accomplish minimum glare. Such adjustments mean that the most intense light strikes the road comparatively near the car, thereby diminishing the visibility at long range and resulting in a most unsatisfactory and dangerous driving-light.

Headlight Adjustment

IT has been demonstrated that headlights glare if they are adjusted for range and that when adjusted for non-glare they have no range.

Ever since the first automobile headlight was placed on a car we have adhered very closely to the parabolic reflector or reflectors having similar vertical characteristics. Various types of lens and of reflector have been designed, but they have mainly to do with spreading the light in the horizontal plane with little change in the vertical distribution.

Tests have demonstrated clearly that, if we are to have range without glare, we must abandon the reflectors of the parabolic type and others of similar characteristics which, after a quarter century of juggling, have proved to be unsatisfactory.

"Hot-Spot" of Light for High-Speed Driving

IN the last few years a tendency has existed to produce a so-called "hot-spot"; that is, a small central area of very high candlepower for high-speed driving.

Unless this hot-spot is projected near the horizontal, where it would produce blinding glare, it is of no great value and, if turned down so as to minimize the glare and come within the legal requirements, it produces a new source of dangerous glare from the oil polished road-surfaces and is especially pernicious on wet nights.

It also becomes a secondary source of discomfort, in some cases more dangerous than the direct glare from the lamp, owing to the lower angle from which it is projected into the approaching driver's eyes.

Side Illumination and Depth of Beam

IT is desirable that the main beam have a good lateral spread so that it will cover for a considerable distance not only the road but also the ditches. The beam should have reasonable depth so as to carry a gradually diminishing illumina-

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Present-Day Headlights

(*Continued from page* 51)

tion well back to within say 20 ft. of the car. It should be of such a character that it will illuminate the wheels and the running-board of the approaching car clearly at a distance of at least 200 ft. without projecting any direct rays into the eyes of the approaching driver.

The majority of the headlights have a sharp horizontal cut-off ranging from 6 to 15 deg. on either side of the center line, which leaves a dark area on both sides of the car for a considerable distance, making it difficult to see the ditches or to judge the passing space available for other cars or to see pedestrians who step into the line of travel at short range.

Light in this area is fully as important as light in any other section, and should be of sufficient intensity so that the side of the road or near-by ditch is clearly visible, and there should be ample light for rounding sharp curves or turning corners independent of the light from the main beam. It also should make the reading of signs on either side of the road possible without the use of spotlights or other auxiliary units.

Many owners today are equipping the righthand fender with what might be called a ditch light or are adding a spotlight, mounted below the radiator and inclined to the right, showing that there is a strong appreciation for the necessity of good side-light.

To compensate further for the defects in the present headlights, a tendency also exists to add hub-lights, courtesy lights and one or more spotlights mounted on the wind-shield to perform the functions which should be taken care of by a single pair of headlights so as to reduce the amount of lighting equipment on the car and the current-drain on the battery.

Tilting Reflectors

MANY cars today have the depressible beam or tilt ray type of headlight, but they do not answer the problem. When tilted or depressed, they give the oncoming driver some relief from glare but imperil the man behind the wheel because his range has been suddenly cut too short for safe driving. If it happens to be a night when the road surface is wet, this sharp deflection of the beam will produce added glare to the oncoming driver. This, if anything, is worse than the direct light from the headlight because it is rising from such a low angle.

Tests have also been made in a number of places throughout the country which show that near cities of any size, in order to give the oncoming driver relief with a depressible beam, the operator would have to manipulate his lamps anywhere from 10 to 30 times per minute. This most drivers will not do. They either leave on the upper beams, which are glaring and make travel dangerous for the approaching drivers, or the tilted beam, which endangers himself, and the occupants of his car.

The headlights of the future should have range without dangerous glare and should not require tilting, dimming, or any other form of manual operation. It is not difficult to design a headlight to suit the man behind the steering-wheel, but it becomes a difficult problem when the other driver who faces the light is taken into consideration. It is right here that the majority of the headlights fail today.

A Course *in* Automotive Ignition

By M. Mallory,

President, Mallory Electric Corporation

Article V [*Types and Construction of Ignition Coils*]

IT has been a rather difficult problem to design an ignition coil or ignition transformer that would produce hot effective sparks at all engine speeds. There is a vast difference between the ignition transformer and transformers used for changing the voltage in power circuits or transformers used in connection with rectifiers, etc.

To build a transformer that will give the greatest efficiency, is to construct it so that the windings will be on a closed magnetic circuit. By this, it is meant the core or laminations be a completely closed circuit with no gaps in it. The reason this type of a transformer can be used in power circuits is because the frequency in such circuits is constant, that is, the pulsations or reversals of the primary or energizing current do not vary.

The closed magnetic circuit transformer cannot be used for ignition purposes because this type of transformer is of very high induction, which means a greater counter electromotive force. A certain length of time is required to overcome this counter electromotive force, which means that this type of transformer will not work in a high frequency circuit such as the primary circuit in the ignition system of the automobile. It would work very efficiently at low engine speeds, because the circuit breaker would be closed for long enough periods to allow the transformer to become saturated but, as the engine speed increased, the transformer would not become saturated, due to the very short closed periods of the primary circuit. Consequently, there would be no spark.

The completely closed magnetic circuit type transformer is more efficient than a transformer containing gaps. The greater the gap in the magnetic circuit, the less efficient is the transformer. But it is practically impossible to use a completely closed magnetic circuit in ignition transformers, for the reasons above stated.

Engineers have always wanted to use an ignition transformer as near to the closed magnetic circuit type as possible but, when this was attempted, the transformer would not produce sparks at high engine speeds due to the greater counter electromotive force. So there has been a compromise in the design and construction of ignition transformers.

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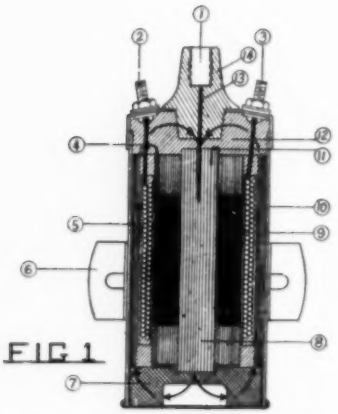


FIG 1

If a transformer of the closed magnetic circuit type is used, it will not work at high engine speeds and if the transformer is designed of the open core type, or of low induction, as the type shown in Figure 2, it will produce sparks at high engine speeds, but these sparks will be very weak at low engine speeds due to the low induction of the transformer. A transformer of low induction will produce sparks at high engine speeds, but the sparks do not contain much heat. The completely closed magnetic circuit transformer will produce very hot sparks at low engine speeds, but will not produce sparks at high engine speeds.

Compromise Between Closed and Open Types

AS a compromise, engineers have designed coils between the completely closed magnetic circuit type and the purely open core type, that is, a coil with a magnetic circuit containing gaps. For example: In the coil shown in Figure 1, 10 indicates a magnetic path. The magnetic lines pass from the ends of the core 8, through the air, to the ends of the magnetic material 10, completing the magnetic circuit. However, this magnetic circuit is of high reluctance because the magnetic lines are forced to travel through the air, as indicated by arrows at each end of the coil.

The coil shown in Figure 2 is of the open core type and the magnetic circuit is completed through the air, instead of through a path of magnetic material. The magnetic circuit in this coil is indicated by the arrows.

The coil shown in Figure 3 does not have a completely closed magnetic circuit. However, the magnetic lines only have to pass through one-eighth of an inch air space. This is indicated at gap 15, which is one-sixteenth of an inch between magnetic circuit 9 and the center core of the coil. The other gap, which is only one-sixteenth of an inch, is indicated at 12, which is between the magnetic circuit 9 and the core of the coil. Although this coil is very near a completely closed magnetic circuit, the construction and design of it causes it to produce the heavy sparks, which is characteristic of a coil having a closed magnetic circuit and still produce sparks of sufficient heat at high engine speeds. The

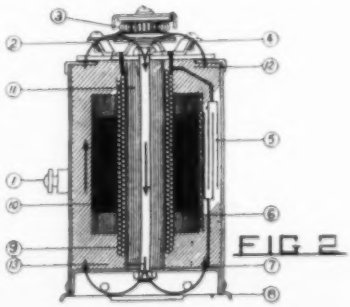


FIG 2

magnetic path of this coil is of very low reluctance, which makes the coil much more efficient.

The coil shown in Figure 4 contains much more magnetic material than the coils shown in Figures 1, 2 and 3, which means that it is of greater induction. This coil also has a magnetic circuit of very low resistance. There is only three-sixteenths of an inch air space that the magnetic lines are forced to travel through. These gaps are located at 4, 5 and 6.

Although the coil shown in Figure 4 is of the transformer type, its special design and construction enables it to function at much higher frequency. In other words, the coil shown in Figure 4 will produce hotter sparks at high speeds.

In this type of coil there is little or no compromise made. It is efficient and will produce hot sparks for all engine speeds. This coil is a perfection of the transformer type coil which, heretofore, has been impractical due to the difficulties explained. This perfection is accomplished through the balancing of the windings, location of windings on the core of the coil and location of the core within the magnetic circuit; also the material used in the core and the design of the external resistance.

Parts and Construction of Different Types of Coils

THE coil shown in Figure 1: 1 is the secondary terminal, 2 and 3 are the primary terminals, 4 is the secondary grounded to the primary, 5 is the primary winding, 6 is the mounting bracket, 7 is a porcelain insulator, 8 core of the coil, 9 secondary winding, 10 magnetic return circuit, 11 inside secondary lead, 12 sealing compound, 13 high tension electrical connection from terminal 1 to core 8, 14 bakelite cap.

As the secondary winding in this type of coil is wound directly over the core, the diameter of the winding is much smaller than it would be if the secondary was wound over the primary winding, as is the case in Figure 2. Being small in diameter, the winding requires much less wire.

The primary winding of this type of coil is shown at 5. As it is wound over the secondary winding, the diameter is very large and a very long length of wire is required to get sufficient number of turns. This long length of wire offers a very high line resistance, possibly twice the resistance as the primary winding shown at 9 in Figure 2.

With the primary wound on the outside of the secondary, a resistance unit is not used, because there is sufficient resistance in the primary, itself.

The core of this coil is insulated away from the engine by the porcelain insulator 7 and the bakelite insulator 14. Instead of the finish of the secondary being connected to the distributor, it is grounded to the primary at 4 and the start of the secondary is connected to the core of the coil which, in turn, is connected to the secondary terminal 1.

Taking the high tension current from the start of the secondary winding, as is the case with this type of coil, it is not necessary to use a bakelite or insulating material of any kind for the case. A metal case is used.

Type Shown in Figure 2

THE coil shown in Figure 2: 1 is the secondary terminal, 2

(*Please turn to page* 56)

primary terminal, 3 resistance coil, 4 primary terminal, 5 condenser, 6 insulator between condenser and secondary winding, 7 condenser lead grounded to coil base, 8 coil base, 9 primary winding, 10 secondary winding, 11 core, 12 sealing compound, 13 bolt that holds coil together.

In connecting a coil of this type in the ignition circuit, the terminal 2 should always be connected to the battery, because the coil has a condenser incorporated in it. To get the condenser located between the contact points and the coil, terminal 4 must be connected to the contact points. It is also necessary to ground the base of this coil to the engine because one side of the condenser is grounded to the base, as shown at 7. When connecting a coil of this type or a coil that has a condenser incorporated on or in it, it is always necessary to set the coil very close to the contact points. If it is not, the coil will not function properly, because the condenser is too far away from the contact points.

This coil has a resistance coil in the external circuit, shown at 3. This unit is used to protect the primary 9 from drawing excessive current from the battery and over-heating.

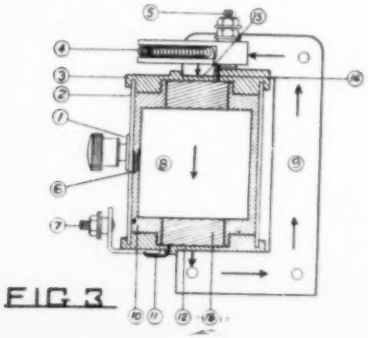


FIG 3

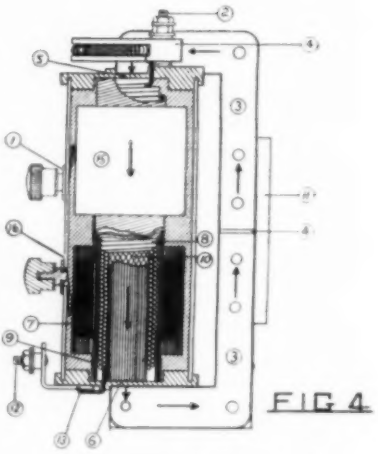


FIG 4

Type Shown in Figure 3

THE coil shown in Figure 3: 1 is the secondary terminal, 2 bakelite case, 3 bakelite head, 4 resistance coil, 5 primary terminal, 6 electrical connection between secondary terminal 1 and secondary winding 8, 7 primary terminal, 9 laminated magnetic circuit, 10 sealing compound, 11 end of primary winding, 12 and 15 indicate air gaps between core of coil and magnetic circuit 9, 13 indicates a primary winding, 14 is one end of the primary.

This coil is very efficient due to greater induction. In connecting it in the ignition circuit, 5 is connected to the battery, 1 to the center of the distributor and 7 to the contact points.

It is necessary to use a condenser with this coil. If there is not a condenser in the distributor, one can be connected in the circuit between terminal 7 and the contact points.

When installing coils, one condenser is all that should be used in

the circuit. If it is not desired to use the one that is in the distributor, another can be used by connecting it between terminal 7 and the contact points, but the condenser that is in the distributor should be disconnected.

The start of the secondary winding in this coil is grounded to the primary at 4 and the finish of the secondary winding is connected to terminal 1, by the connection 6.

The magnetic circuit is indicated by the arrows. The resistance unit 4 on this coil is a special feature. It is of special material and, when the ignition switch is first turned on, the coil will draw a heavy current from the battery for starting. The heavy draw is due to the resistance wire 4 being cold. This wire is of very low resistance when cold, and high resistance when hot. As soon as the engine starts, the resistance unit warms up and checks the current flow, preventing excessive current draw and burning of the contact points. As the engine speeds up and the interruption of the primary circuit increases, which checks the current flow, the resistance unit (4) cools off and reduces the resistance in the primary circuit, allowing the coil to draw more current from the battery for the higher engine speeds.

This unit is similar to an electric valve. It controls the flow of the primary current, which compensates to a large extent for the variation of engine speeds and has an advantage over the type of coil which does not have a resistance unit.

The coil shown in Figure 2 does have a resistance unit, but not of special advantage other than to protect the primary winding from overheating. It has a very short length of wire.

Type Shown in Figure 4

THE coil shown in Figure 4: 1 and 16 are secondary terminals, 2 primary terminal, 3 laminated magnetic circuit, 4, 5 and 6 are air gaps in magnetic circuit, 7 and 15 are secondary windings, 7 being cut away to show construction, 8 is primary winding, 9 is insulator between primary and secondary winding, 10 is tube around core of coil, 11 is mounting bracket, 12 is primary terminal, 13 end of primary winding, 14 is resistance unit. It has two secondary windings instead of one, as shown in the other types of coils. These windings are connected together in series. The outside leads of the secondaries are brought out at terminals 1 and 16.

With this type of coil the spark plugs can be spaced to thirty-five thousandths on high speed engines and still the engine will not miss at high speeds or start hard. The wider setting of the spark plugs makes carburetor adjustments less difficult and improves engine performance. This coil overcomes many difficulties of ignition.

When this type of coil is connected in the circuit and the spark plug gaps are spaced wider, the timing of the engine should be slightly advanced to get the best results. The terminal 2 should be connected to the battery and terminal 12 to the contact points.

The primary connections on this coil are the same as the one shown in Figure 3, and the condenser is connected in the circuit between the terminal 12 and the contact points, if there is not a condenser in the distributor.

Terminal 1 is connected to the

(*Continued on page* 64)

The Trouble Shooter

A DEPARTMENT devoted to correspondence from readers of The FLEET OWNER. Any questions having to do with fleet maintenance will be answered in this department. All properly signed inquiries will be replied to by mail and such of them as are believed to be of possible interest to other readers will be published in these columns.

Address your questions to the Trouble Shooter Editor. We must decline to reply to correspondence not signed with the writer's full name and address. The inquirer's name will not be published.

Pinion Adjustment on Acme

Question: On a model 36 Acme truck, what is the correct way to adjust the rear axle pinion shaft for end play?—J. M. S., Haverstraw, N. Y.

Answer: The rule for adjusting roller bearings applies here, which is as follows: Be sure bearing cone and cup are free from grit and then tighten the adjusting nut to a point where the bearing begins to bind; then slacken the nut off from a quarter to a half turn until the bearing turns freely. Then fasten it with the locking device.

On this particular truck, the pinion adjustment is made by removing a small cap or plate on the side of the housing and loosening the jam nut on pinion shaft and turning the adjusting nut to the right until the end play is taken out of the shaft. After making sure that it does not bind, set the jam nut up securely and the job is finished.

Test for Dragging Brakes

Question: Please tell us the best way in which to test for dragging brakes. We make brake adjustments and sometimes have comebacks from our drivers who claim that their brakes heat up after a few miles.—E. J., Seattle, Wash.

Answer: The old, time-honored method is to jack up the rear-end and the front end separately, and spin each wheel by hand. This does not take into consideration the fact that the wheel bearings might be worn, resulting in a different condition when the weight of the car rests on the axle shafts and bearings.

A better way would be to take the car out on a smooth, level road, run it up to a speed of 30 m. p. h., shift to neutral and let the car coast. When the speedometer drops to 25 m. p. h. begin to time the deceleration. At the end of exactly one minute the car should be rolling 5 m. p. h. or faster. If it stops before this, the

brakes are too tight.

To offset the effects of any wind, it is well to make this test in both directions on the same level stretch. The average time taken for the car to decelerate from 25 to 5 m. p. h. should be not less than 60 seconds.

We believe this test will show up any tendency for the brakes to drag. If this test is made in cold weather, it would be well for you to run the car for a few miles before making the test, in order that the grease in the rear end is thoroughly warmed up.

Removing Essex Pistons

Question: We are about to replace the piston rings in a 1926, six-cylinder Essex Coach and have been told that the pistons must be taken out through the bottom. As it will be some time before we can spare this car long enough for us to do the job, I would appreciate it if you will tell me just what the procedure is on this job.—G. L. S., Riverhead, L. I., N. Y.

Answer: You have been advised correctly that the pistons must be removed from the bottom on this particular job. This is because the bosses at the bottom of the connecting rods are too big to go through the bores of the cylinder.

In fact you do not have to take off the head at all, unless you want to remove the carbon and grind the valves. When pulling the piston and rod assembly through the bottom, it will be necessary to turn the crankshaft throws to one side in order to get them out. It will not be necessary to remove the counterweights from the crankshaft. However, you may run across a few burrs or high spots on the counterweights, which you can file off, if these interfere with the removal of the pistons.

Replacing Dodge Timing Chain

Question: We have a Dodge four-cylinder car in our fleet that refused to run. This is a 1928 model. Upon removing the radiator and the timing chain case cover we find that the timing chain has broken.

Please give us the proper practice to correctly apply the chain so that the job will be in right time.—G. P., Chicago, Ill.

Answer: You will notice that both the crankshaft sprocket and the camshaft sprocket have a punch mark on them. All that you have to do is to see that these two sprockets are turned so that they face each other. To make sure of this, take a straight edge and place it across the centers of both shafts and see that the punch marks are in line with the straight edge. Then apply the chain in the usual manner.

Whatever Your Question

We shall be glad to give you the benefit of our knowledge and experience. The columns of The Fleet Owner are open to its readers. Send in those hard knots. If we cannot solve them we will refer them to people who can.

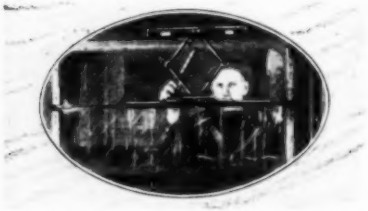
The Trouble Shooter Editor.

What YOU

New Products of Interest to Fleet Owners

Cinch Windshield Wiper

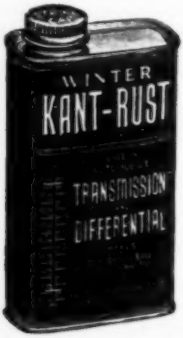
A NEW heavy duty, hand-operated windshield wiper for trucks and busses has recently been placed on the market by Cinch Mfg. Corp., 2335 W. Van Buren Street, Chicago, Ill.



This wiper cleans downward and leaves a clear area of 2 square feet. It is easily operated and automatically returns to the top of the windshield. The blade is 24" wide and has a 12" vertical travel. List price $5.50 each.

Winter Kant-Rust

THE Kant-Rust Products Corp., Rahway, N. J., is offering a new liquid for winter use.



This is recommended especially for adding to the oil in crankcases, transmissions and differentials, which will obviate changing this lubricant over to a winter grade. Its dissolving properties are claimed to keep lubricants from congealing at below zero temperatures. Also recommended for oiling shutters, brake mechanism, etc. Sold in ½ pint cans, gallon cans and five gallon drums.

License Plate Frame

THIS new accessory is known as the Fit-All auto plate frame, offered by Larson Tool & Stamping Co., Attleboro, Mass.

The frame, shown above, is made of highly polished aluminum and is easy to assemble without screws, nuts or special tools. The spring holds it securely in place around the plate.

WANT *to* KNOW

Water Pump Spanner

THE pack nut on the new Ford car is slotted to take a special wrench, without which a hammer and cold chisel are the only tools that will do the job, and these two implements are not always at hand.

The Apco-Mossberg Corp. of Attleboro, Mass., has made a water pump wrench of carbon steel, heat treated and finished in nickel. This is a tool that fits perfectly and makes an easy job out of a hard one.

Fleet Car Washer

A HEAVY duty car washer especially designed for large

public utility companies, fleet and taxicab owners operating wash racks, has recently appeared. It is made by U. S. Air Compressor Company, Cleveland, Ohio, and is their model AW-2.

This is a two-gun machine, enabling two men to wash a car, truck or bus at the same time. The pump has a capacity of ten gallons of water per minute and delivers 325 lbs. pressure to each gun. It is equipped with a 3 h. p. motor, mounted on a steel channel base, 12" from the floor.

Equipment includes two 25-ft. lengths of hose, two pistol-grip guns, two shut-off cocks, two-way valve and six feet of suction hose with strainer.

Spray Gun for Light Oils

IN conjunction with the use of Kant-Rust lubricants, the Kant-Rust Products Corp. of Rahway, N. J., is offering the special type spraying gun, shown herewith.

The long nozzle, easy grip and trigger control makes this gun ideally suited for all type of spray lubricating work. The gun may be also used for cleaning motors.

A special deal which includes 5 gallons of lubricant, a pour-easy drum and the spray gun shown above is offered at $22.50.

What Seven Operators Think

(Continued from page 22)

overhauls by means of periodic inspections and tightening up. One thing we do not believe in is what we term a 'non-productive inspection', by which we mean for an inspector to go out, check over a machine, do no work, but turn in a report for someone else's scrutiny and possible action as to the mechanical defects reported.

"Our so-called inspections really constitute a complete going over and tuning up of the vehicle from radiator to tail-light. In making these inspections, it frequently happens that the mechanic will find that there is potential trouble such as a cylinder or a crankshaft out of round, which in time will need attention. When this condition is discovered, the shop foreman is called in and it is decided whether this needs work at once or the machine can be operated safely and economically for a further period without, say, removing the cylinder-block and regrinding both the cylinder and crankshaft.

"The fundamental thought in all our work is to keep our vehicles operating efficiently and economically as long as possible and to defer major overhauls as long as possible. In connection with this phase of fleet operation, one problem we feel is worthy of considerable attention and study. It is physically possible to maintain any unit of equipment in 100-per cent condition; but this is obviously an unwise and uneconomical thing to attempt. The question to be solved is: In what condition is it proper to maintain a fleet of working units; that is 90, 80, of 70 or what per cent of 100, correct?

"We always have been firmly convinced that the efficient and economical operation of any fleet is contingent entirely on our so-called general inspection or tightening up and tuning up. The question is how often this operation should be performed. For a long time we were striving at an elapsed time of 30 days per vehicle between inspections, but our mechanical expense seemed to be runing too high and, to economize, we decided to try lengthening the period between inspections. We made the elapsed time 60 days, and this resulted in marked economy of repair costs. One result from this was that the number of trouble tickets as turned in by the drivers increased somewhat but not to anything like an extent to offset the economies effected by doubling the time between inspections.

"For a number of years we have been using with careful accuracy what we called our breakdown report. This is a report for the information of the shop foreman and his superiors of all calls from the field for a mechanic to go out in case of a breakdown from any cause. In the last analysis, transportation is successful only so long as the wheels keep rolling, and we feel that the breakdown report will furnish as true an index as we know of to show the mechanical condition of our fleet. We are satisfied to maintain our own shop based on the extent of mechanical condition and present cost."

Fleet No. 5—Uses Unit Replacement System; Farms Out Major Work

"FOR a long time the unit-replacement system was used and quite a number of spare engines, transmissions and rear ends were kept on hand. Engines and rear ends were overhauled and would be put

in the cars when required. This seemed that the equipment was kept going continuously, and it was thought a good job was being done.

"An analysis of the cost indicated that this was not the case and that it was more economical to trade in old equipment at the end of a certain life, doing only the necessary work on the vehicles during their service life to keep them in operating condition. This plan has been followed for about 2 years and a substantial saving has been effected, since going to this system of making only minor repairs, close inspection, and replacing the equipment.

"If there is a failure that warrants some major work, the job is sent out to some organization which has a good reputation and can do the work on the flat-rate basis. Our operation under this system is quite successful."

Fleet No. 6—Operates Own Shop; Farms Out Few Jobs

"WE do not hesitate to avail ourselves of the services of outside specialty shops when a commensurate saving in truck time or repair expense can be brought about. We refer particularly to cylinder-block regrinding jobs, body-construction work, and even the complete overhauling of various mechanical units by such outside concerns.

"Briefly, we operate on the principle that we are not primarily in the vehicle-repair business. Whenever it is possible to have our work done more cheaply than we can do it ourselves, or even as cheaply, such work is farmed out, and the resources of our company shops are conserved for work which we cannot farm out. Before such work is let out, however, we satisfy ourselves fully as to the dependability of the outside shop bidding upon the work.

"We do not use the flat-rate system in our repair shops, as we do not see where any distinct advantage would be gained, even though it were entirely practicable to use it. The flat-rate system, as we see it, is primarily for the purpose of letting the customer know, with a fair degree of accuracy, just what a certain job will cost him. When the car goes into the garage, that particular job is performed, and no other, even though in the opinion of the shop it would be economical to care for other matters requiring mechanical attention at the same time.

"We do, however, have a close watch on the work that is done outside; close inspection by a competent mechanic and invoices checked for parts and labor against the report submitted by the mechanic. This is charged to the job in order to check the total cost."

Fleet No. 7—Overhauls Large Units; Replaces Smaller Ones

"AT one time we used the complete overhaul system and had quite a shop in operation, with machinery for almost every mechanical operation, but due to scattered locations of our cars, the repair bills were much higher than was necessary, and it was necessary to have several reserve cars which could be used to replace other cars while they were in the shop for overhauling, repairs, or painting. Also, this system involved too much time in taking the cars to, and returning them from, the shop, which added to the overhead. Then we found that, when a car was completely overhauled, so much was expected of it that, if any mechanical feature was not functioning as it should, we received severe complaint from the district to which the car was sent. (*Continued on page* 64)

What Jobs to Farm Out?

(*Continued from page 63*)

"When we figured the cost per mile of the car up to the time it was overhauled, the money spent in overhauling it, and compared these with the cost per mile after the overhauling had been done, we noticed that the cost per mile for the period after the overhauling was considerably higher than that for the earlier life of the car.

"We have since found that we can actually save money by disposing of the cars, regarding as depreciation the amount of money which would be spent in overhauling them. In this way we have obtained a much lower cost per mile. This does not apply to the heavier equipment, as our heavy trucks, which are expensive, are given more consideration regarding overhauling. This is in defense of our system of periodic inspections and periodic unit repairs."

Bus Garage Design

(*Continued from page 32*)

will avoid damage to both the doors and the buses.

Openings of this size present a problem with respect to the possibility of providing suitable doors that will stay in shape and work properly at all times.

Experience has shown that the ordinary swinging or sliding doors of wood, such as have been used successfully in car houses and other buildings, are not suitable for garage use owing to their extreme size as the door gets out of shape in a short time, resulting in operating difficulties. It is therefore necessary to use doors constructed of all metal or metal and wood in combination.

Doors which slide either horizontally or vertically are preferable to doors which swing as they can be operated more quickly and are better suited to mechanical means of operation. Electrically operated entrance and exit doors are in use in many parts of the country and have given very satisfactory results. Such operation can be controlled by means of a push button.

With doors which are designed to slide horizontally, the best results will be obtained if the weight of the door is supported on large wheels running on a track in the floor, the top simply being guided, instead of following the old practice of hanging the doors at the top and guiding them at the bottom.

When the doors are required between sections of a garage through fire walls, it is advisable and is also required by the insurance companies that the doors be of the automatic closing type.

In order that the door may operate as designed, it is not advisable to make the door too wide and for ordinary purposes it would be well to limit the width to not over 12 ft., the height, of course, to be sufficient to give a few inches clearance above the highest type of bus operated.

(*This article to be continued*)

(Editor's Note: This article was read before the recent Convention of the American Electric Railway Engineering Association. Illustrations through courtesy of the Association.)

Automotive Ignition

(*Continued from page 57*)

center of the distributor and terminal 16 is grounded to the engine to complete the secondary circuit. The resistance unit 14 has the same features as the resistance unit shown in Figure 3.

Stewarts Improve Motor on 2½, 3 and 4 Ton Models

THE Stewart Motor Corporation of Buffalo, makers of Stewart Motor Trucks, announce several motor improvements just made on their Model 18X—2½ ton, Model 19X—3 ton and Model 22—4 ton.

Without changing the bore and stroke on the above models, it has been possible to increase the power approximately 10 per cent by the use of counter-weights on the crankshaft. These counter-weights are so applied and designed that they balance the pistons and connecting rods, thus increasing the smoothness of the motor which greatly increases its life.

How the Jobber Serves

(*Continued from page 39*)

from other sources, the matters of expressage, postage, freight and carting sometimes amount to more than what the saving would be.

Then too, the fact that the fleet operator can get "what he wants *when* he wants it," would seem to overshadow, by far, any saving of a few cents or dollars on purchases, if this directly resulted in getting the job out of the shop and *back on the road*, in a shorter time. The latter seems to be the most important advantage that the automotive jobber has to offer.

An interesting folder that explains how fleet operators have saved 20% on the cost of their liability insurance with absolute safety and a most thorough service is offered by Allied Mutuals Liability Insurance Co., 25 W. 43rd St., New York City.

Selecting the Battery

(*Continued from page 45*)

THE bus battery must also be of rugged construction to stand the rough handling and shocks it is sure to receive. The case should be substantially built and be as acid proof as possible. If wood is used in the construction, there should be an ample number of tie rods, both top and bottom, to keep the individual cells from ever working loose and breaking the connectors.

After the proper size and type of battery has been selected, it is equally important that the care and up-keep should be such that the best service can be had from this battery at the least expense.

Cloyes Gears: A complete new catalog issued by Cloyes Gear Works, 17214 Roseland Avenue, Cleveland, Ohio, contains over 430 numbers. The line includes both silent and metal timing gears for replacement in passenger car, truck and bus motors. Complete sets of both metal and silent gears are a new feature.

WANTED!

- **Suggestions from Shop Superintendents all over the country.**
- **Write us to-day, telling us what you think of this new publication; what it lacks; what it should have and what you would like it to be.**
- **Your comment is earnestly solicited—we want this publication to be truly "The Fleet Owners' Own." Will you help us to make it such?**

The Editor.

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Centralized Maintenance

(*Continued from page* 18)

off to the outside of the building by means of exhauster fans. The exhausters are provided with a controller so that the amount of suction may be regulated to meet the necessary requirements. The ducts through which the air passes are provided with dampers so that the ventilation may be directed to any number or all of the thirteen stalls.

With this ventilating system it is possible to draw off and replace all the air in the room in one half minute. Each of these spraying stalls have been provided with a direct sewer connection, and once a month by means of a chemical solution they are thoroughly cleansed from any of the pyroxylin materials which may have collected.

The Paint Shop has also been provided with a dust-proof finishing room where the brush work and final finishing work is completed.

After all the repair work has been completed the vehicle is again thoroughly cleaned with a chemical preparation mixed with live steam and then rinsed with hot water before going to the paint shop.

After all work is completed the vehicle is returned to the Inspection Division for final inspection and test.

With the aid of a modern and up-to-date standardization of repair equipment and the establishment of ideal working conditions for the men, there has been brought about the greatest possible efficiency and economy in maintaining the automobile fleets of the Companies.

This Reconditioning Station has been favorably commented on by many in the automobile and automobile truck industry who are familiar with the problems of fleet maintenance.